

FIG. 1

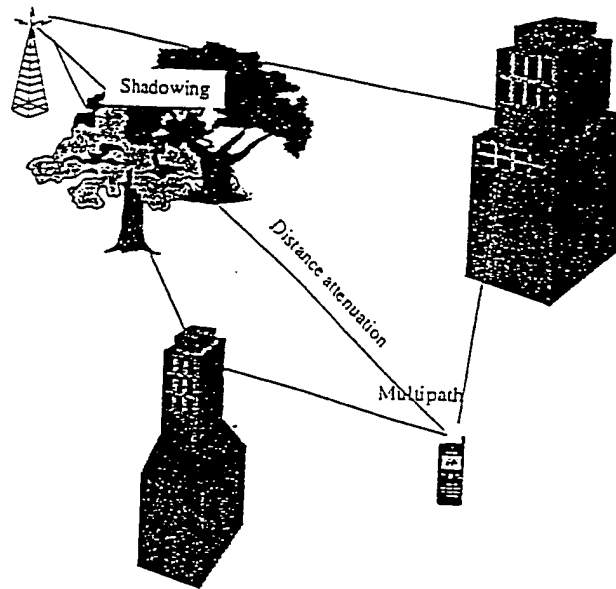


FIG. 2

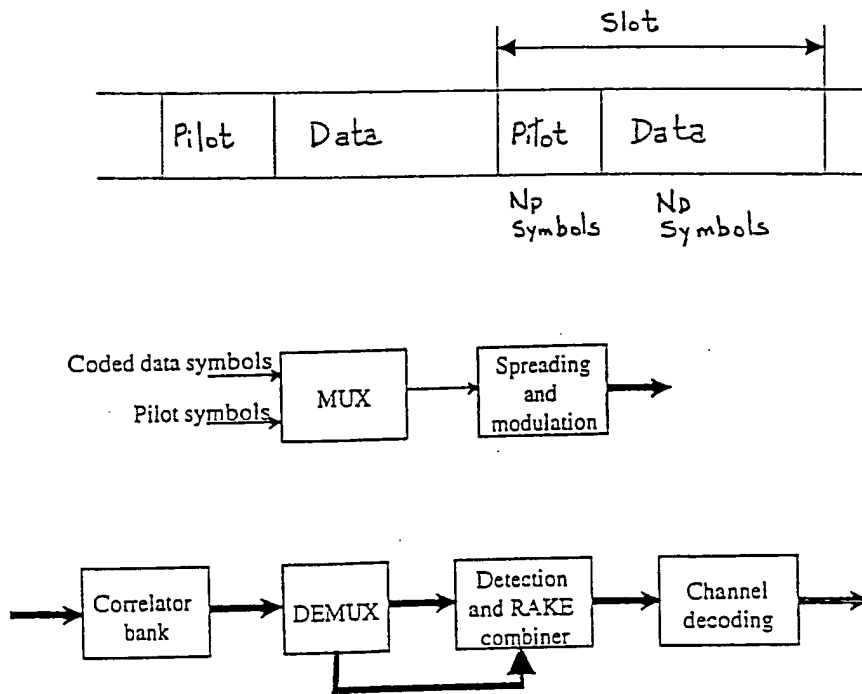


FIG. 3

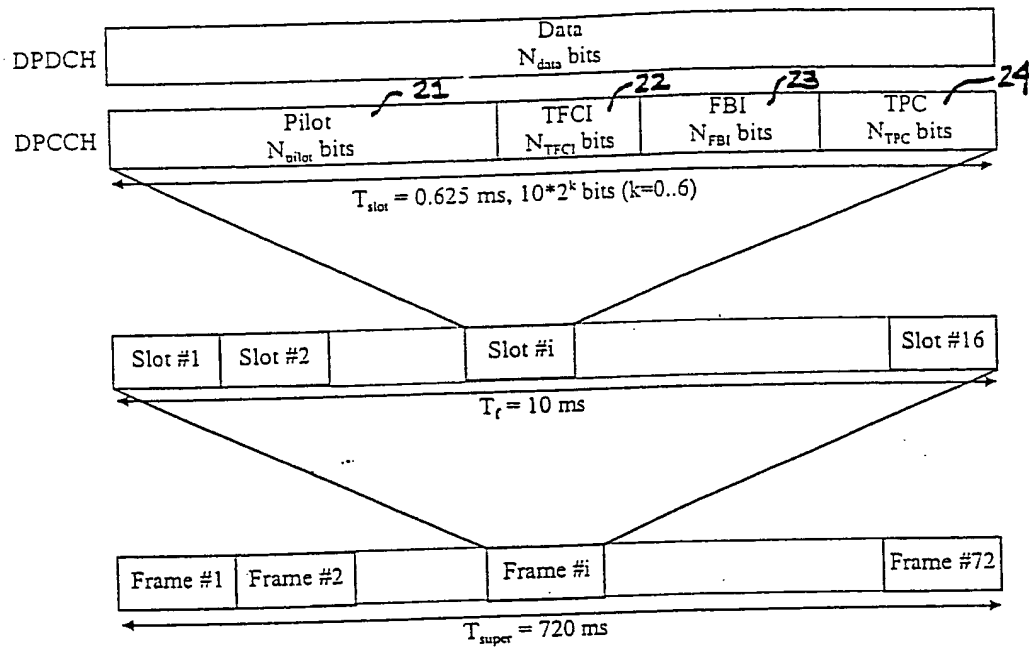


FIG. 4

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{pilot}	N_{TPC}	N_{TFCI}	N_{FBI}
16	16	256	160	10	6	2	2	0
16	16	256	160	10	8	2	0	0
16	16	256	160	10	5	2	2	1
16	16	256	160	10	7	2	0	1
16	16	256	160	10	[6]	[2]	[0]	[2]
16	16	256	160	10	[5]	[1]	[2]	[2]

FIG. 5

	$N_{\text{pilot}} = 6$						$N_{\text{pilot}} = 8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	0	1	1	1	1	1	1	0	1	1
3	1	0	1	1	0	1	1	0	1	1	1	0	1	1
4	1	1	0	1	0	1	1	1	1	0	1	0	1	1
5	1	1	0	1	1	1	1	1	1	0	1	1	1	1
6	1	1	0	1	1	1	1	1	1	0	1	1	1	1
7	1	0	1	1	0	0	1	0	1	1	1	0	1	0
8	1	1	0	1	0	1	1	1	1	0	1	0	1	1
9	1	1	1	1	0	0	1	1	1	1	1	0	1	0
10	1	0	1	1	0	1	1	0	1	1	1	0	1	1
11	1	1	1	1	1	0	1	1	1	1	1	1	1	0
12	1	0	1	1	0	1	1	0	1	1	1	0	1	1
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	1	0	1	0	0	1	1	1	0	1	0	1	0
15	1	0	1	1	0	0	1	0	1	1	1	0	1	0
16	1	0	0	1	0	0	1	0	1	0	1	0	1	0

FIG. 6

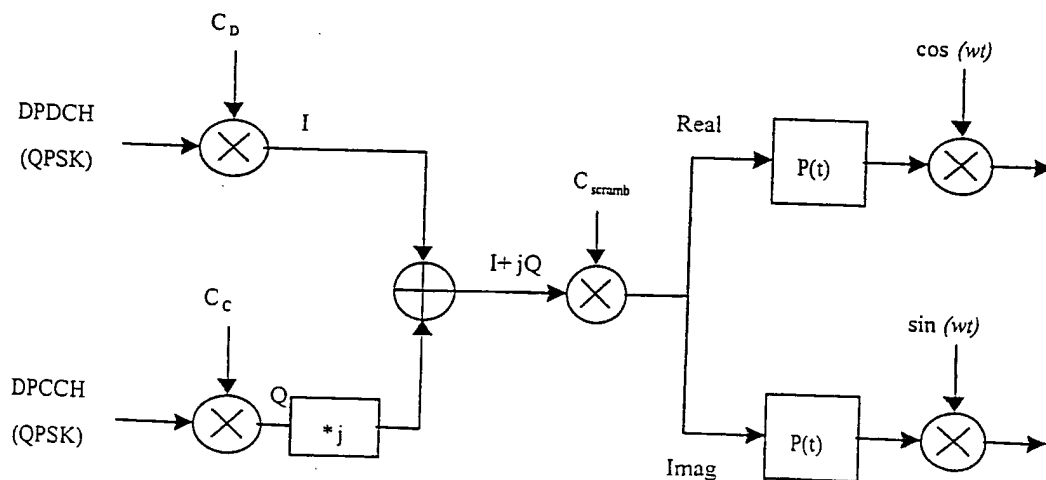


FIG. 7

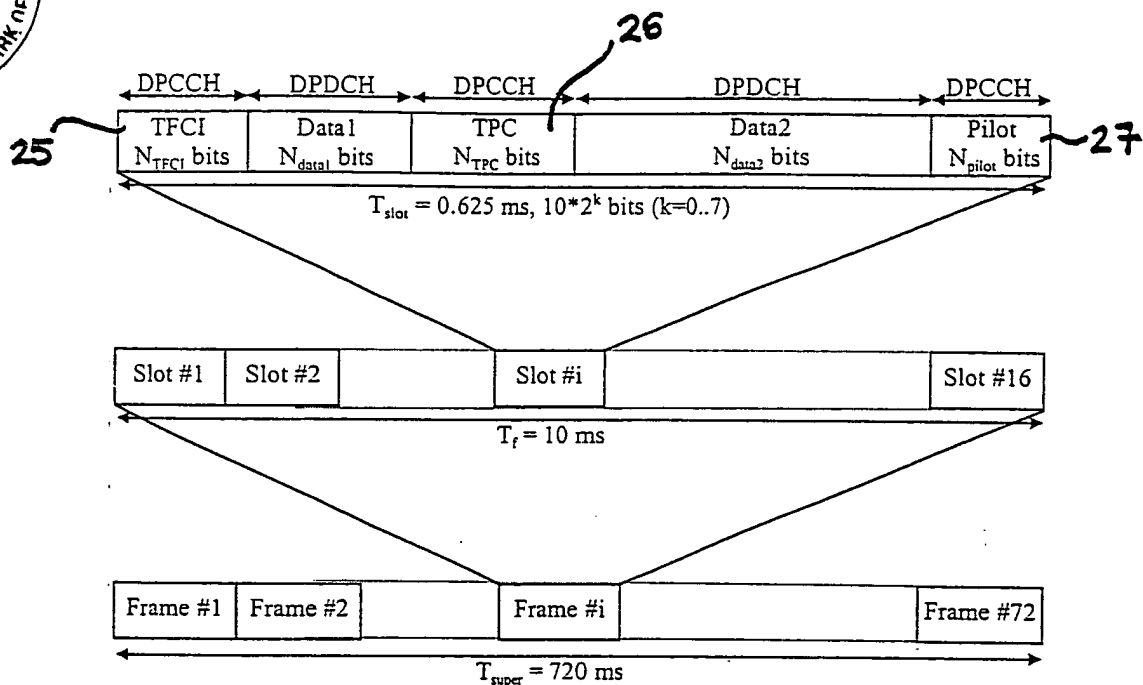
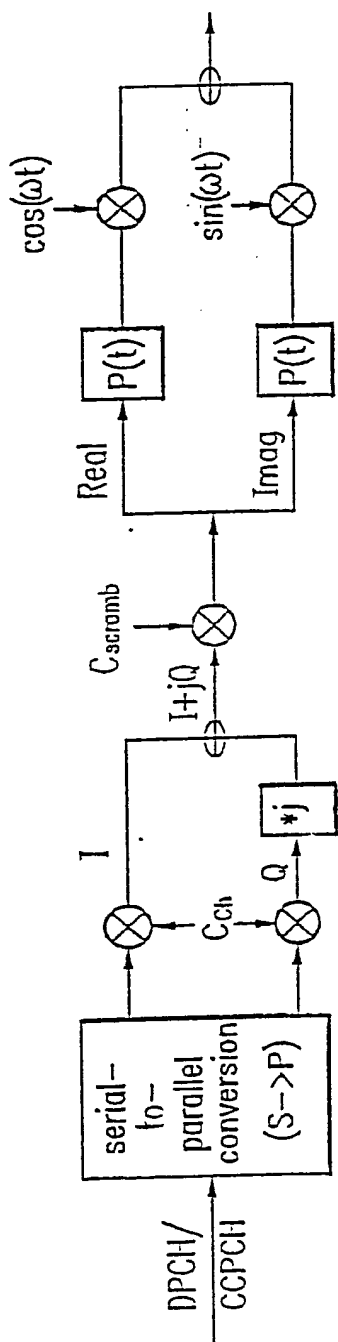


FIG. 8

Symbol rate	8ksps		16,32,64,128ksps				256,512,1024ksps							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot # 1	11	11	11	11	11	11	11	11	11	11	11	11	11	10
2	11	11	11	11	11	01	11	10	11	10	11	10	11	01
3	11	10	11	01	11	01	11	10	11	01	11	11	11	01
4	11	01	11	10	11	01	11	11	11	01	11	00	11	10
5	11	10	11	10	11	11	11	11	11	00	11	01	11	10
6	11	10	11	10	11	11	11	11	11	11	11	01	11	10
7	11	01	11	01	11	00	11	10	11	11	11	01	11	10
8	11	00	11	10	11	01	11	01	11	00	11	10	11	00
9	11	00	11	11	11	00	11	11	11	10	11	00	11	01
10	11	10	11	01	11	01	11	01	11	11	11	11	11	00
11	11	10	11	11	11	10	11	10	11	10	11	11	11	10
12	11	11	11	01	11	01	11	01	11	10	11	10	11	00
13	11	10	11	00	11	01	11	10	11	01	11	11	11	10
14	11	11	11	10	11	00	11	00	11	10	11	10	11	00
15	11	00	11	01	11	00	11	01	11	10	11	00	11	00
16	11	00	11	00	11	00	11	10	11	00	11	00	11	00

FIG. 9

FIG. 10



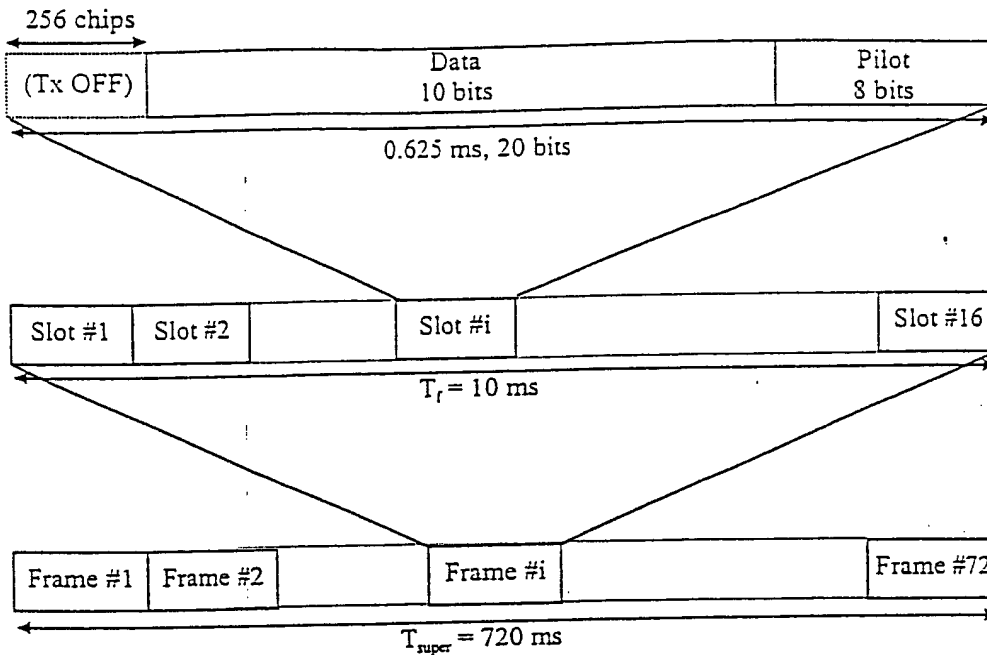


FIG. 11A

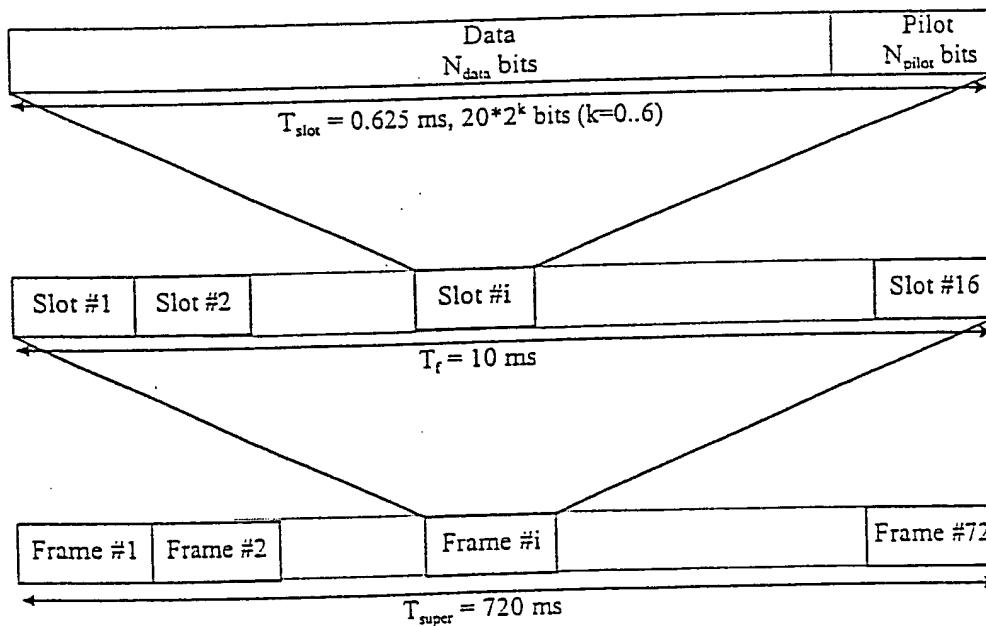


FIG. 11B



Frame Synchronization Words															
Slot Number	1	2	3	4	5	L								
	$C_1=(1101111100100000)$														
	$C_2=(1000101001110101)$														
	$C_3=(1101110000100011)$														
	$C_4=(0111011010001001)$														
	$C_5=(1011000001001111)$														
	$C_6=(1110010100011010)$														
	$C_7=(0100001110111100)$														
	$C_8=(1110100100010110)$														

FIG. 12A

$R(\tau)$	τ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$		16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
$R_F(\tau)$		16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
$R_G(\tau)$		16	4	0	-4	0	4	0	-4	-16	-4	0	4	0	-4	0	4
$R_H(\tau)$		16	-4	0	4	0	-4	0	4	-16	4	0	-4	0	4	0	-4
<div style="display: flex; justify-content: space-around; align-items: center;"> { R_1 R_2 </div>																	

FIG. 12B

$(R_E(\tau) + R_F(\tau)), \text{ or } (R_G(\tau) + R_H(\tau))$

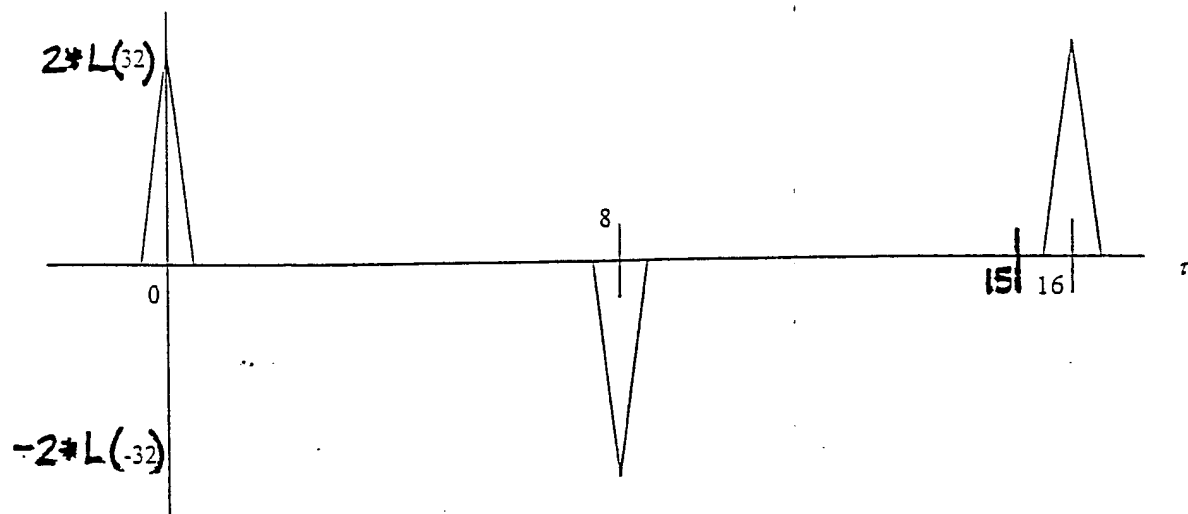


FIG. 13A

$R_E(\tau) + R_F(\tau) + R_G(\tau) + R_H(\tau)$

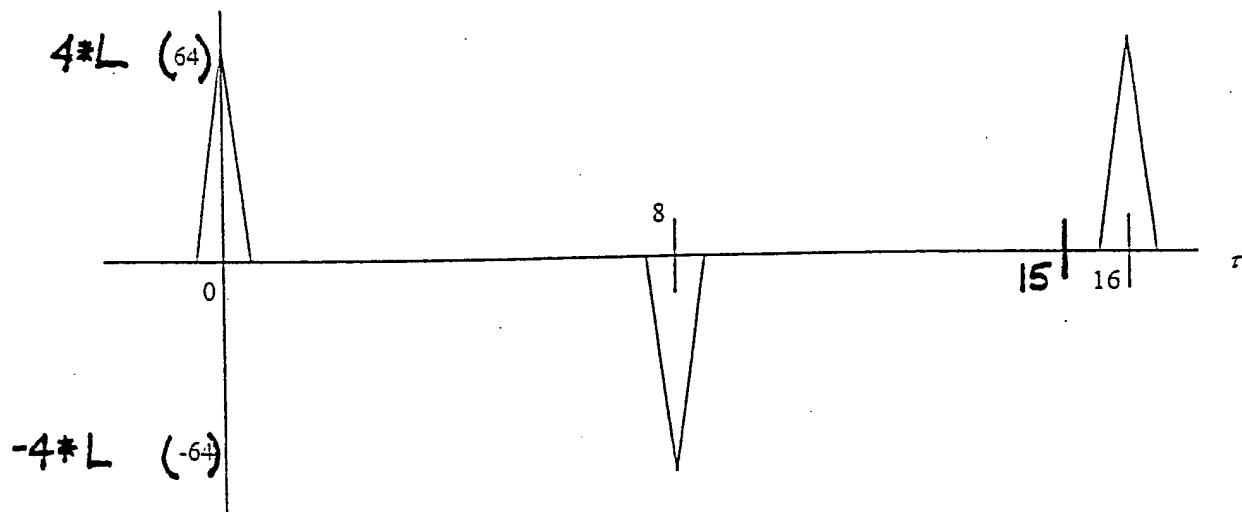


FIG. 13B



	$N_{slot} = 5$					$N_{slot} = 6$					
Bit #	0	1	2	3	4	0	1	2	3	4	5
Slot #1	1	1	1	1	0	1	1	1	1	1	0
2	1	0	1	1	1	1	1	0	1	1	1
3	0	0	1	0	1	1	0	0	1	0	0
4	1	0	1	1	1	1	1	0	1	1	1
5	1	1	1	1	0	1	1	1	1	1	0
6	1	0	1	1	1	1	1	0	1	1	1
7	1	1	1	0	1	1	1	1	1	0	1
8	1	0	1	0	0	1	1	0	1	0	0
9	0	0	1	0	1	1	0	0	1	0	1
10	0	0	1	0	0	1	0	1	1	0	0
11	1	1	1	1	0	1	1	1	1	1	0
12	0	1	1	0	0	1	0	1	1	0	0
13	0	0	1	0	1	1	0	0	1	0	1
14	0	1	1	0	0	1	0	1	1	0	0
15	0	0	1	1	0	1	0	0	1	1	0
16	0	1	1	1	1	1	0	1	1	1	1

FIG. 14A

Bit #	$N_{pilot} = 7$							$N_{pilot} = 8$							
	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
4	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
6	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
7	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
11	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
12	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
13	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
14	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
15	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
16	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1

FIG. 14B



N_{pilot}	Pilot bit position #	Corresponding word of length 16
5	0	C_1
	1	C_2
	3	C_3
	4	C_4
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
7	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 14C

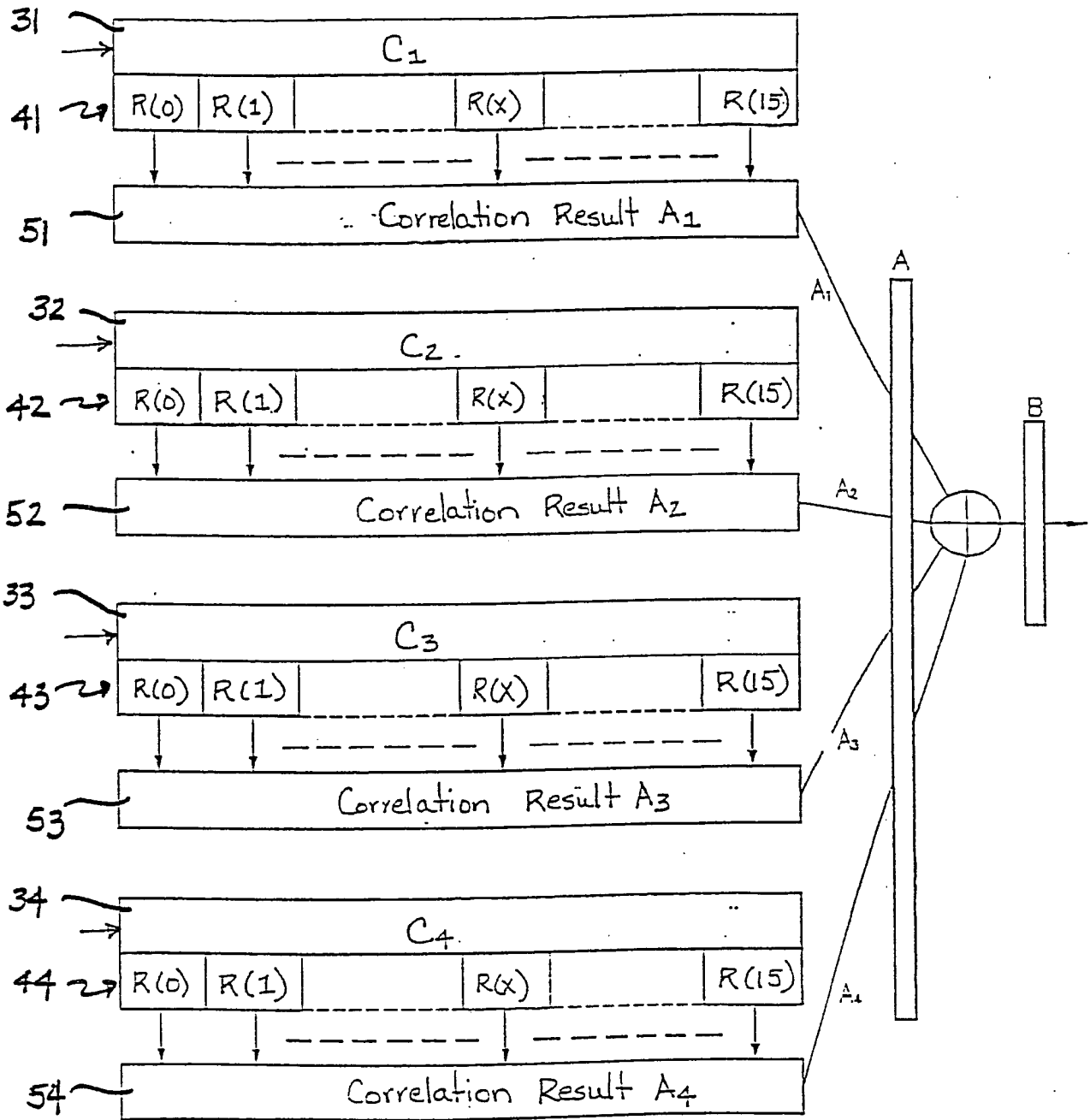


FIG. 14D

	R_x (0)	R_x (1)	R_x (2)	R_x (3)	R_x (4)	R_x (5)	R_x (6)	R_x (7)	R_x (8)	R_x (9)	R_x (10)	R_x (11)	R_x (12)	R_x (13)	R_x (14)	R_x (15)
A ₁ POINT	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
A ₂ POINT	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
A ₃ POINT	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
A ₄ POINT	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
B POINT	64	0	0	0	0	0	0	0	-64	0	0	0	0	0	0	0

FIG. 14E

	R_x (0)	R_x (1)	R_x (2)	R_x (3)	R_x (4)	R_x (5)	R_x (6)	R_x (7)	R_x (8)	R_x (9)	R_x (10)	R_x (11)	R_x (12)	R_x (13)	R_x (14)	R_x (15)
A ₁ POINT ÷ A ₂ POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A ₃ POINT ÷ A ₄ POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A ₁ POINT ÷ A ₄ POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A ₂ POINT ÷ A ₃ POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0

FIG. 14F

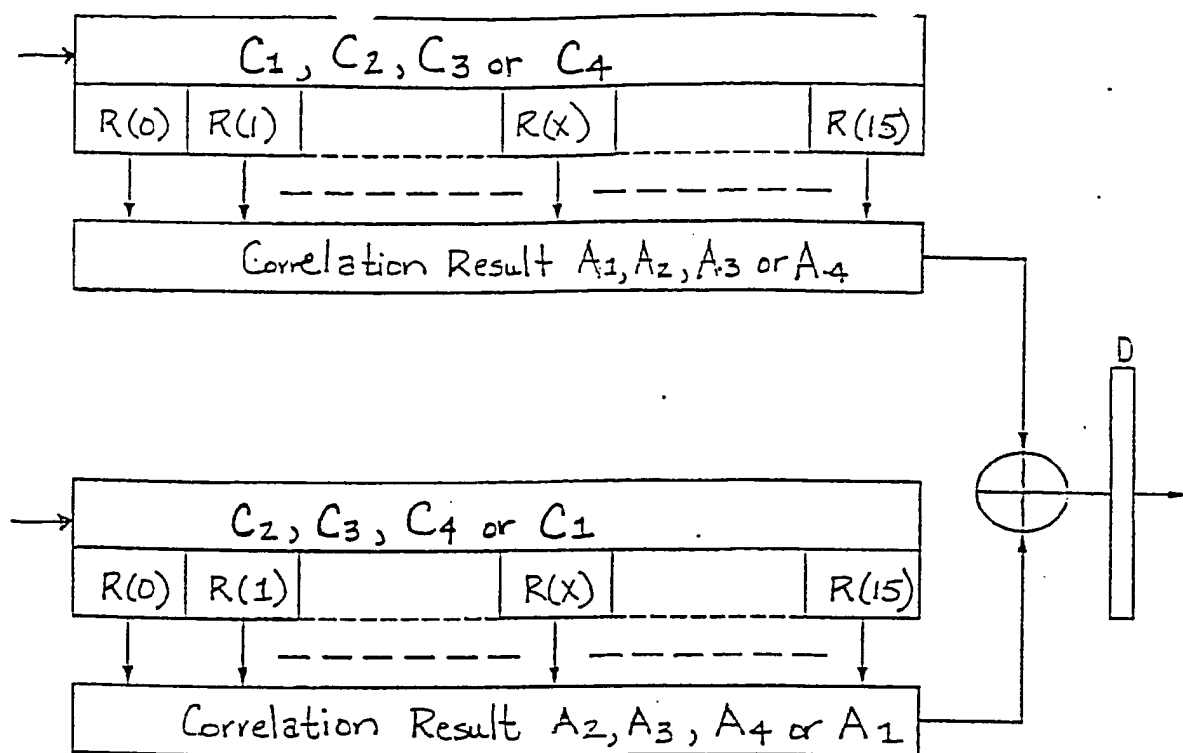


FIG. 14G

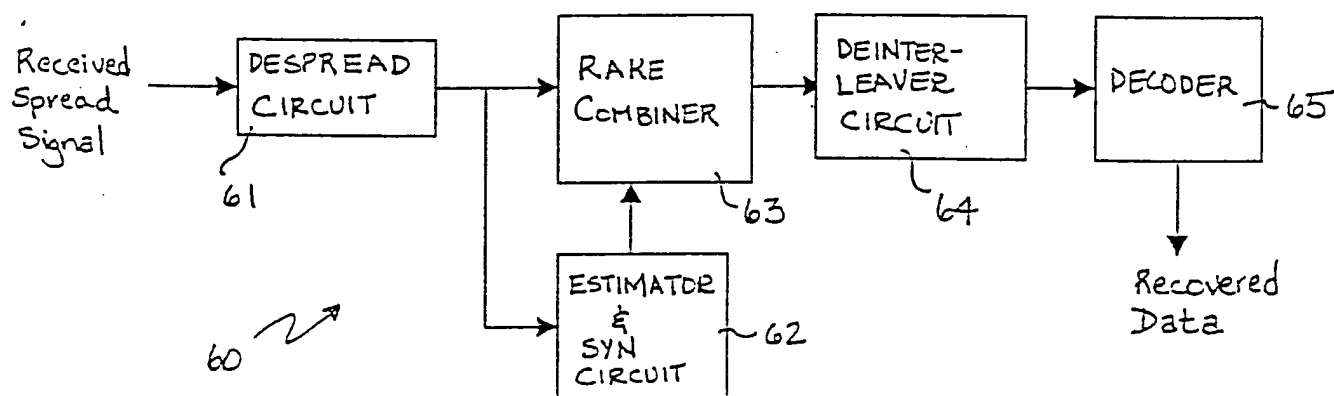


FIG. 14H

	R_x (0)	R_x (1)	R_x (2)	R_x (3)	R_x (4)	R_x (5)	R_x (6)	R_x (7)	R_x (8)	R_x (9)	R_x (10)	R_x (11)	R_x (12)	R_x (13)	R_x (14)	R_x (15)
A_1 POINT	16	-4	-4	8	0	-4	0	0	-4	0	0	-4	0	8	-4	-4
A_2 POINT	16	0	0	-4	-4	-4	0	0	12	0	0	-4	-4	-4	0	0
A_3 POINT	16	4	0	0	4	8	8	0	0	0	8	8	4	0	0	4
A_4 POINT	16	0	4	-4	0	0	-4	4	0	4	-4	0	0	-4	4	0
B POINT	64	0	0	0	0	0	4	4	8	4	4	0	0	0	0	0

FIG. 14I

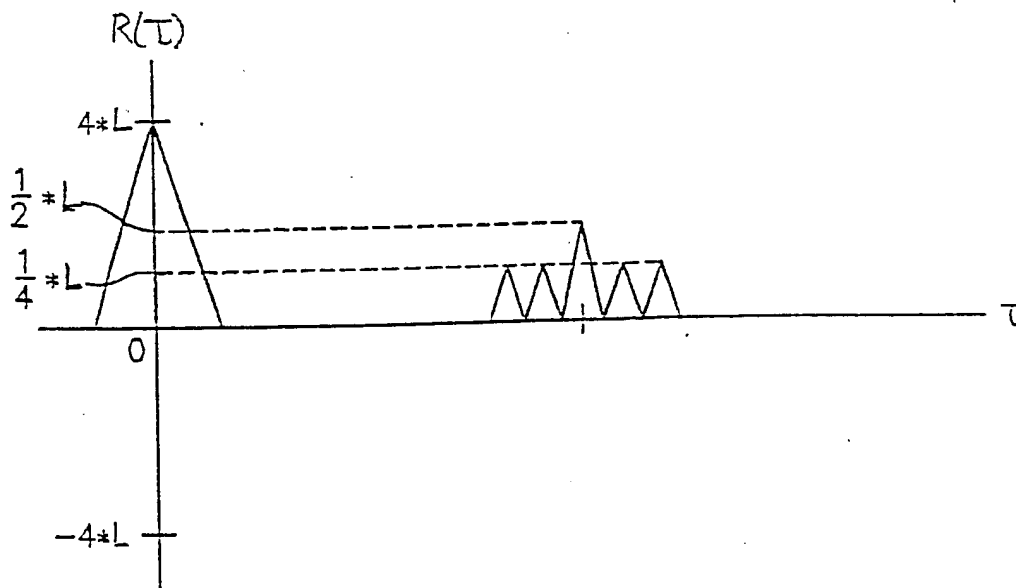


FIG. 14J



	$N_{pi.} = 4$		$N_{pilot} = 8$				$N_{pilot} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 15A

Symbol rate	Symbol #	Channel	Corresponding word of length $L=16$
$N_{pilot} = 4$	1	I-CH	C_1
		Q-CH	C_2
$N_{pilot} = 8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{pilot} = 16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 15B

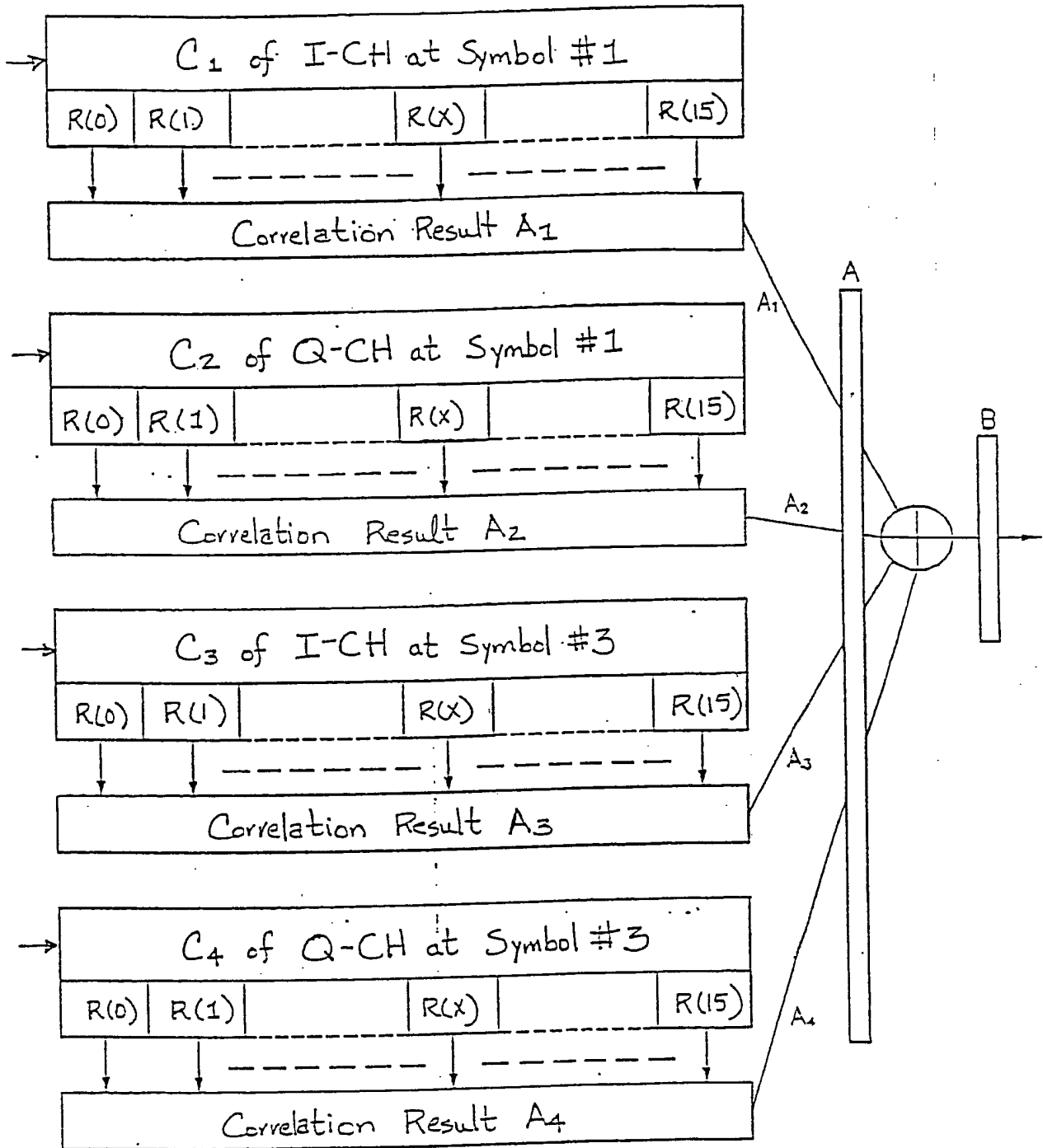


FIG. 15C



Symbol #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	01
4	11	10	11	11
5	11	11	11	10
6	11	10	11	11
7	11	11	11	01
8	11	10	11	00
9	11	00	11	01
10	11	01	11	00
11	11	11	11	10
12	11	01	11	00
13	11	00	11	01
14	11	01	11	00
15	11	00	11	10
16	11	01	11	11

FIG. 16A

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C ₁
	Q-CH	C ₂
3	I-CH	C ₃
	Q-CH	C ₄

FIG. 16B

	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 1$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 16C

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{\text{pilot}} = 8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{\text{pilot}} = 16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 16D

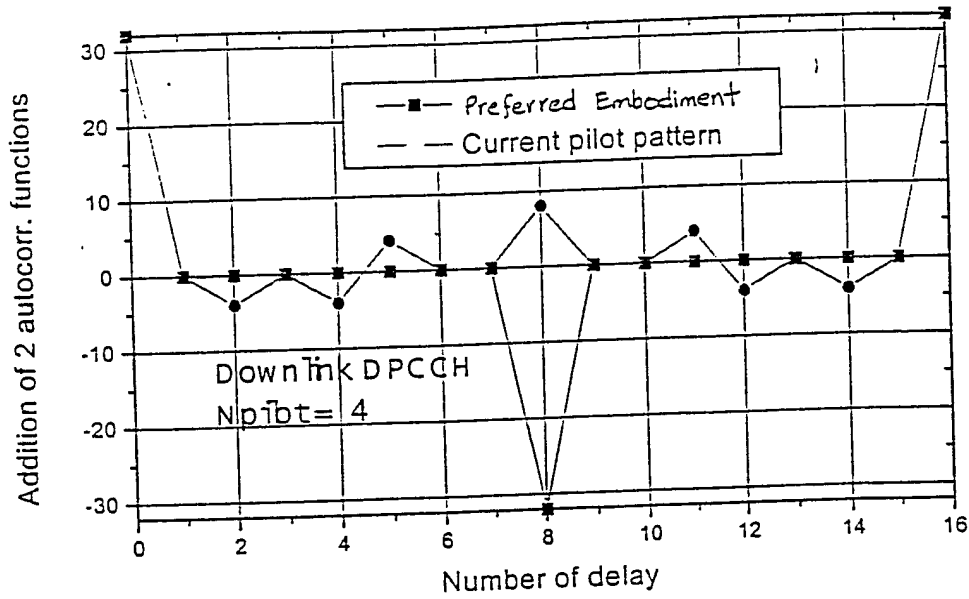


FIG. 17A

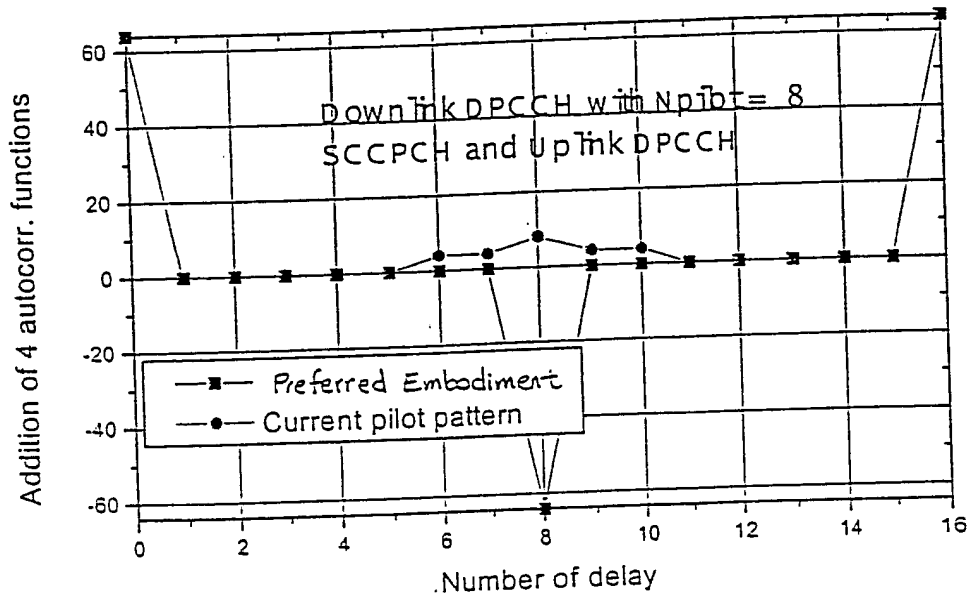


FIG. 17B

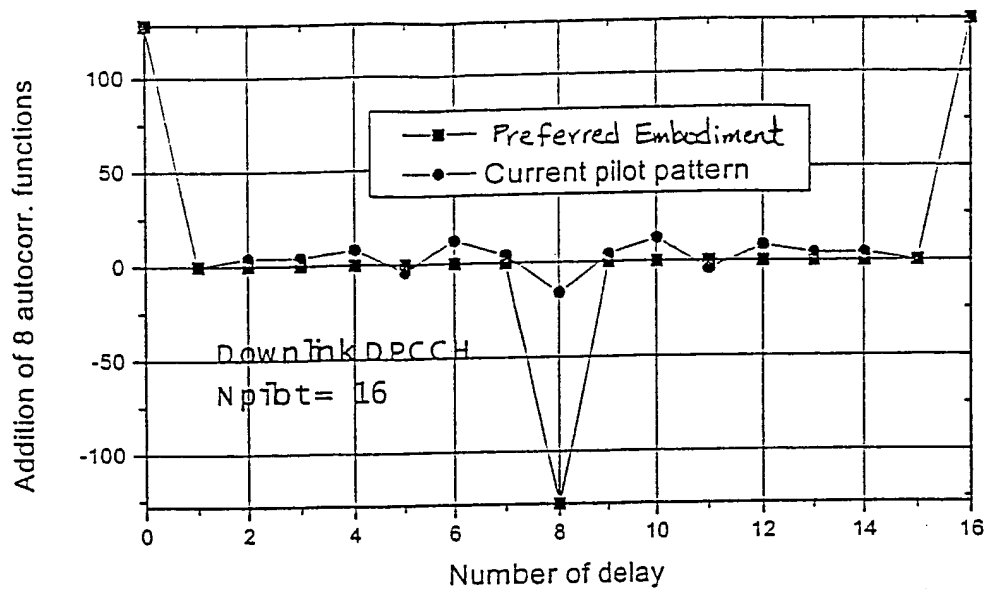


FIG. 17C

Parameters	Downlink
Slot per frame	16
Number of bits in the DPCCH (Pilot/TPC/TFCI)	4/2/0
Number of bits in the DPDCH per each slot	4
Spreading factor (DPDCH)	512
Spreading factor (DPCCH)	512
Modulation	QPSK
3dB bandwidth	4.096MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propagation channel	AWGN

FIG. 18A

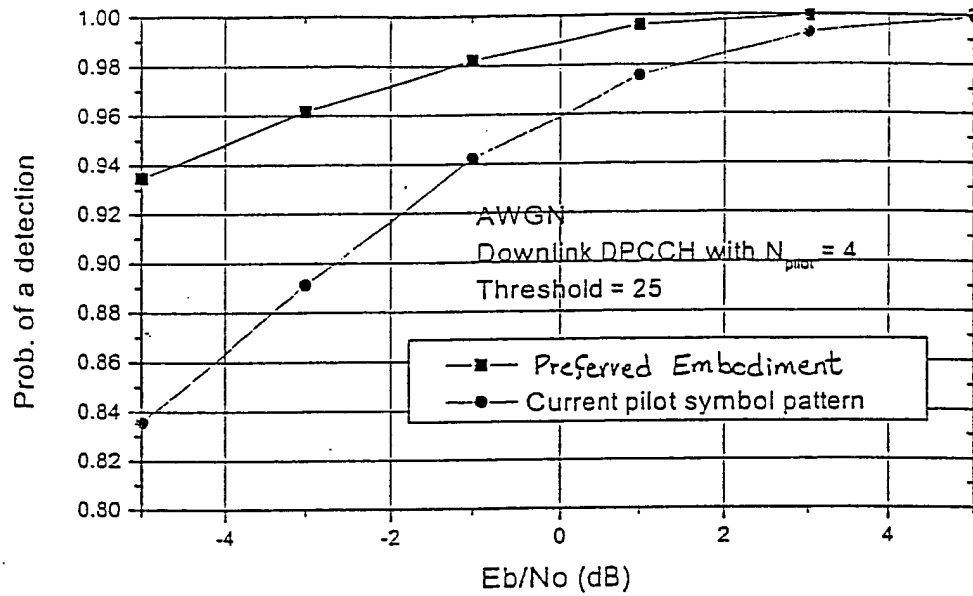


FIG. 18B

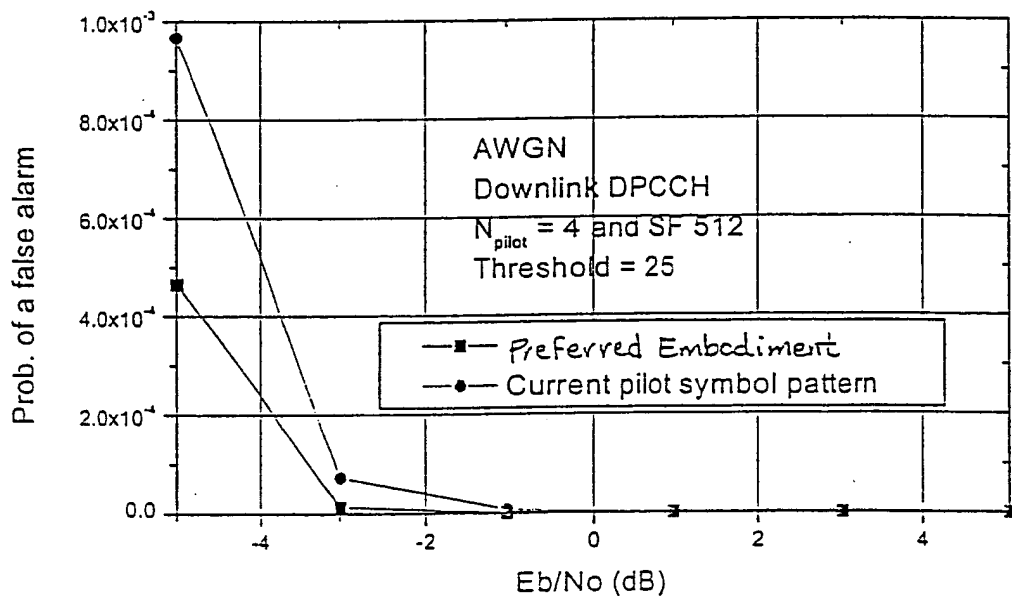


FIG. 18C

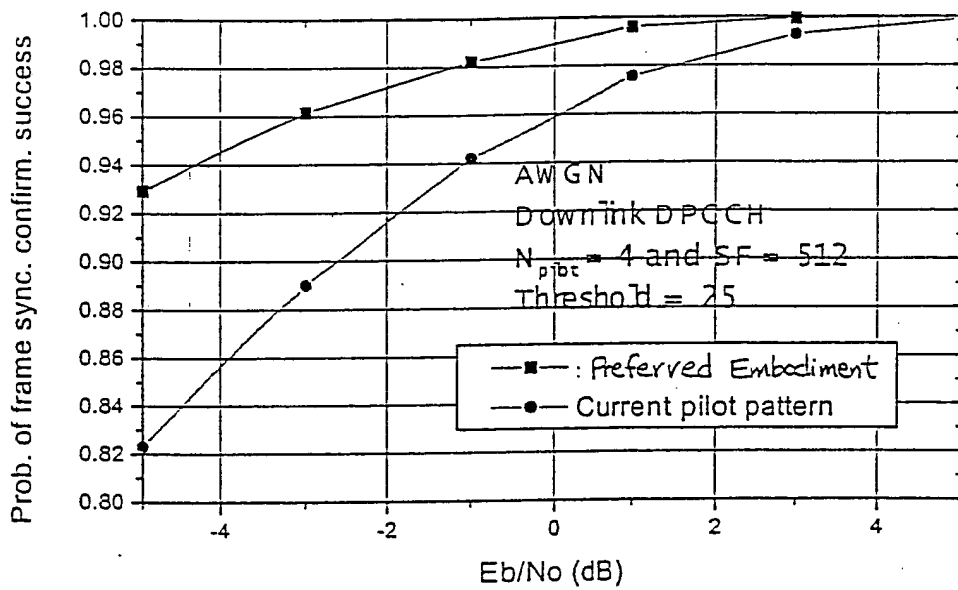


FIG. 18D

	$N_{\text{pilot}} =$		$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	11	00	10
2	00	10	11	01	00	11	11	01	00	11	11	01	00	00
3	10	10	11	11	00	01	11	11	00	01	11	11	00	10
4	00	10	11	01	00	11	11	01	00	11	11	10	00	11
5	01	10	11	00	00	10	11	00	00	10	11	11	00	01
6	00	10	11	01	00	11	11	01	00	11	11	10	00	00
7	01	10	11	11	00	10	11	11	00	10	11	00	00	01
8	00	10	11	10	00	11	11	10	00	11	11	01	00	00
9	10	10	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	11	10	00	00	11	10	00	00	11	10	00	11
11	01	10	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	11	10	00	00	11	10	00	00	11	01	00	00
13	10	10	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	11	10	00	00	11	10	00	00	11	01	00	11
15	10	10	11	00	00	01	11	00	00	01	11	11	00	10
16	11	10	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19A

Symbol rate	Symbol #	Channel	Corresponding Word of length 16
$N_{\text{pilot}} = 4$	0	I-CH	$-C_1$
		Q-CH	C_2
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_3
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 19B



Symbol #	0	1	2	3
Slot #1	11	11	00	01
2	11	10	00	00
3	11	00	00	10
4	11	10	00	00
5	11	11	00	01
6	11	10	00	00
7	11	11	00	10
8	11	10	00	11
9	11	00	00	10
10	11	01	00	11
11	11	11	00	01
12	11	01	00	11
13	11	00	00	10
14	11	01	00	11
15	11	00	00	01
16	11	01	00	00

FIG. 19C

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C_1
	Q-CH	C_2
3	I-CH	$-C_3$
	Q-CH	$-C_4$

FIG. 19D

	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	11	00	10
2	11	01	00	11	11	01	00	11	11	01	00	00
3	11	11	00	01	11	11	00	01	11	11	00	10
4	11	01	00	11	11	01	00	11	11	10	00	11
5	11	00	00	10	11	00	00	10	11	11	00	01
6	11	01	00	11	11	01	00	11	11	10	00	00
7	11	11	00	10	11	11	00	10	11	00	00	01
8	11	10	00	11	11	10	00	11	11	01	00	00
9	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	00	00	11	10	00	00	11	10	00	11
11	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	00	00	11	10	00	00	11	01	00	00
13	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	00	00	11	10	00	00	11	01	00	11
15	11	00	00	01	11	00	00	01	11	11	00	10
16	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19E

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_8
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 19F



Sequence	Autocorrelation
$C_1=(1101111100100000)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_2=(1000101001110101)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_3=(1111101100000100)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_4=(0101000110101110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_5=(0011101111000100)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_6=(0010010111011010)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_7=(0111000010001111)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_8=(1011101001000101)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_9=(0011011111001000)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_{10}=(0010100111010110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_{11}=(1100000100111110)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_{12}=(1011100101000110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_{13}=(0100001110111100)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_{14}=(1000100101110110)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_{15}=(0000100011110111)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_{16}=(1001000101101110)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4

FIG. 20A

$R(\tau)$ τ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
$R_F(\tau)$	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
$R_G(\tau)$	16	4	0	-4	0	4	0	-4	-16	-4	0	4	0	-4	0	4
$R_H(\tau)$	16	-4	0	4	0	-4	0	4	-16	4	0	-4	0	4	0	-4

FIG. 20B

	$N_{pilots} = 6$						$N_{pilots} = 8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	1	0	1	0	1	0	1	1	1	0
4	1	1	0	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	0
6	1	1	0	1	0	0	1	1	1	0	1	0	1	0
7	1	1	1	1	1	0	1	1	1	1	1	1	1	0
8	1	1	0	1	1	1	1	1	1	0	1	1	1	1
9	1	0	0	1	0	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	0	1	1	1	0	1	0
11	1	1	1	1	0	1	1	1	1	1	1	0	1	1
12	1	0	1	1	0	0	1	0	1	1	1	0	1	0
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	0	1	1	1	1	1	0	1	1	1	1	1	1
15	1	0	0	1	0	1	1	0	1	0	1	0	1	1
16	1	0	1	1	0	0	1	0	1	1	1	0	1	0

FIG. 20C

N_{pilots}	Pilot bit position #	Corresponding word of length 16
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 20D



Symbol rate	8ksps		16,32,64,128ksps				256,512,1024ksps							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot # 1	11	11	11	11	11	10	11	11	11	10	11	00	11	01
2	11	10	11	10	11	11	11	10	11	11	11	00	11	10
3	11	00	11	00	11	10	11	00	11	10	11	11	11	11
4	11	10	11	10	11	11	11	10	11	11	11	10	11	11
5	11	11	11	11	11	10	11	11	11	10	11	10	11	01
6	11	10	11	10	11	00	11	10	11	00	11	01	11	00
7	11	11	11	11	11	10	11	11	11	10	11	10	11	01
8	11	10	11	10	11	11	11	10	11	11	11	11	11	00
9	11	00	11	00	11	01	11	00	11	01	11	11	11	10
10	11	01	11	01	11	00	11	01	11	00	11	11	11	01
11	11	11	11	11	11	01	11	11	11	01	11	00	11	00
12	11	01	11	01	11	00	11	01	11	00	11	01	11	00
13	11	00	11	00	11	01	11	00	11	01	11	01	11	10
14	11	01	11	01	11	11	11	01	11	11	11	10	11	11
15	11	00	11	00	11	01	11	00	11	01	11	01	11	10
16	11	01	11	01	11	00	11	01	11	00	11	00	11	11

FIG. 20E



Symbol rate	2048,4096ksps															
Symbol #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Slot # 1	11	11	11	10	11	00	11	01	11	00	11	11	11	01	11	01
2	11	10	11	11	11	00	11	10	11	00	11	10	11	10	11	00
3	11	00	11	10	11	11	11	11	11	11	11	01	11	00	11	00
4	11	10	11	11	11	10	11	11	11	10	11	01	11	00	11	01
5	11	11	11	10	11	10	11	01	11	01	11	01	11	01	11	10
6	11	10	11	00	11	01	11	00	11	10	11	00	11	00	11	00
7	11	11	11	10	11	10	11	01	11	10	11	00	11	10	11	00
8	11	10	11	11	11	11	11	00	11	11	11	11	11	11	11	01
9	11	00	11	01	11	11	11	10	11	11	11	00	11	10	11	10
10	11	01	11	00	11	11	11	01	11	11	11	01	11	01	11	11
11	11	11	11	01	11	00	11	00	11	00	11	10	11	11	11	11
12	11	01	11	00	11	01	11	00	11	01	11	10	11	11	11	10
13	11	00	11	01	11	01	11	10	11	10	11	10	11	10	11	01
14	11	01	11	11	11	10	11	11	11	01	11	11	11	11	11	11
15	11	00	11	01	11	01	11	10	11	01	11	11	11	01	11	11
16	11	01	11	00	11	00	11	11	11	00	11	00	11	00	11	10

FIG. 20F



Symbol rate	Symbol #	Channel	Corresponding word : of length 16
8ksps	1	I-CH	C ₁
		Q-CH	C ₂
16, 32, 64, 128ksps	1	I-CH	C ₁
		Q-CH	C ₂
	3	I-CH	C ₃
		Q-CH	C ₄
256, 512, 1024ksps	1	I-CH	C ₁
		Q-CH	C ₂
	3	I-CH	C ₃
		Q-CH	C ₄
	5	I-CH	C ₅
		Q-CH	C ₆
	7	I-CH	C ₇
		Q-CH	C ₈
2048, 4096ksps	1	I-CH	C ₁
		Q-CH	C ₂
	3	I-CH	C ₃
		Q-CH	C ₄
	5	I-CH	C ₅
		Q-CH	C ₆
	7	I-CH	C ₇
		Q-CH	C ₈
	9	I-CH	C ₉
		Q-CH	C ₁₀
	11	I-CH	C ₁₁
		Q-CH	C ₁₂
	13	I-CH	C ₁₃
		Q-CH	C ₁₄
	15	I-CH	C ₁₅
		Q-CH	C ₁₆

FIG. 20G



Symbol #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	10
4	11	10	11	11
5	11	11	11	10
6	11	10	11	00
7	11	11	11	10
8	11	10	11	11
9	11	00	11	01
10	11	01	11	00
11	11	11	11	01
12	11	01	11	00
13	11	00	11	01
14	11	01	11	11
15	11	00	11	01
16	11	01	11	00

FIG. 20H

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C ₁
	Q-CH	C ₂
3	I-CH	C ₃
	Q-CH	C ₄

FIG. 20I



Frame Synchronization Words															
L=15, Slot No.	1	2	3	4	15									
$C_1 = (1\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 0\ 0)$															
$C_2 = (1\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0)$															
$C_3 = (1\ 1\ 0\ 0\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 1\ 1)$															
$C_4 = (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1)$															
$C_5 = (1\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 0\ 0\ 1)$															
$C_6 = (1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 1\ 0\ 0)$															
$C_7 = (1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 1\ 0\ 0\ 0)$															
$C_8 = (0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 1)$															

FIG. 21

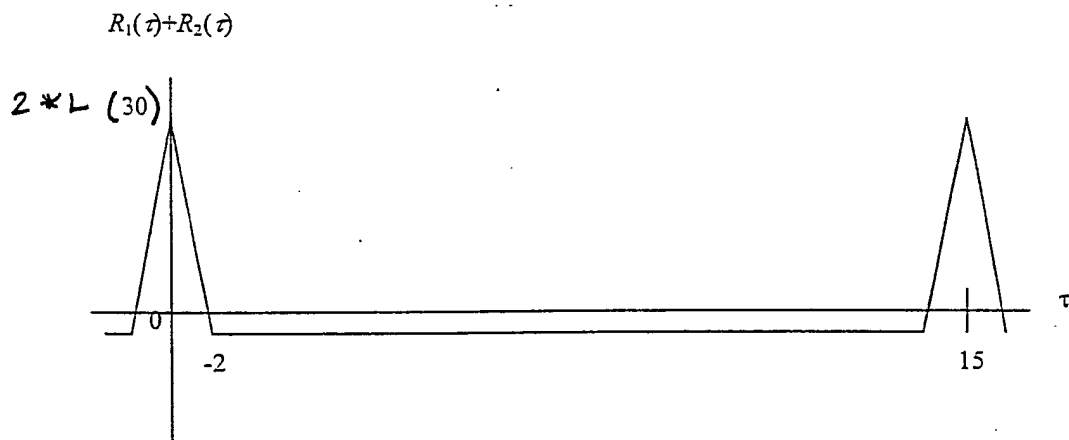


FIG. 22A

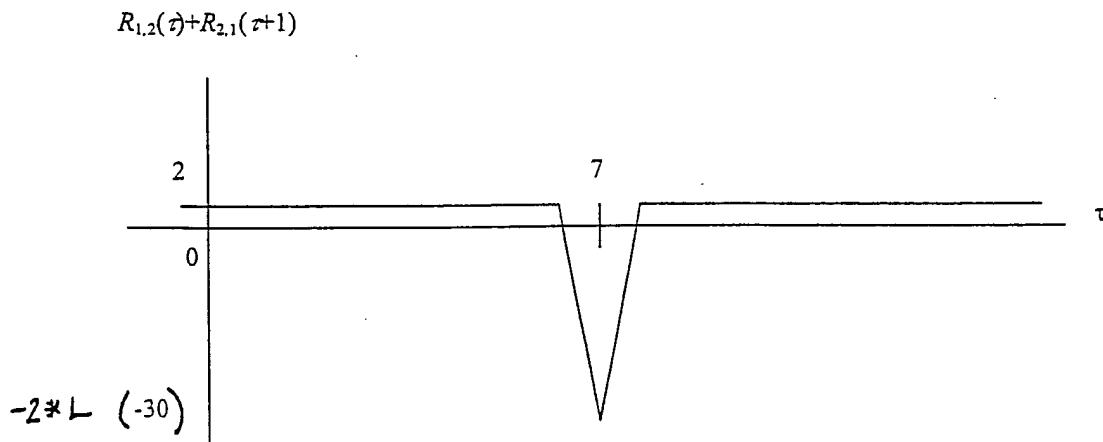


FIG. 22B



$$R_1(\tau) + R_2(\tau) + R_3(\tau) + R_4(\tau)$$

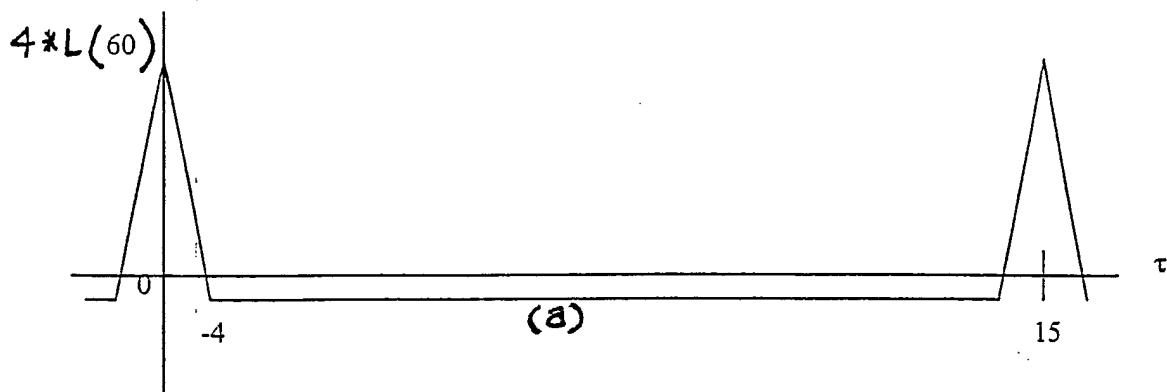


FIG. 22C

$$R_{1,2}(\tau) + R_{2,1}(\tau+1) + R_{3,4}(\tau) + R_{4,3}(\tau+1)$$

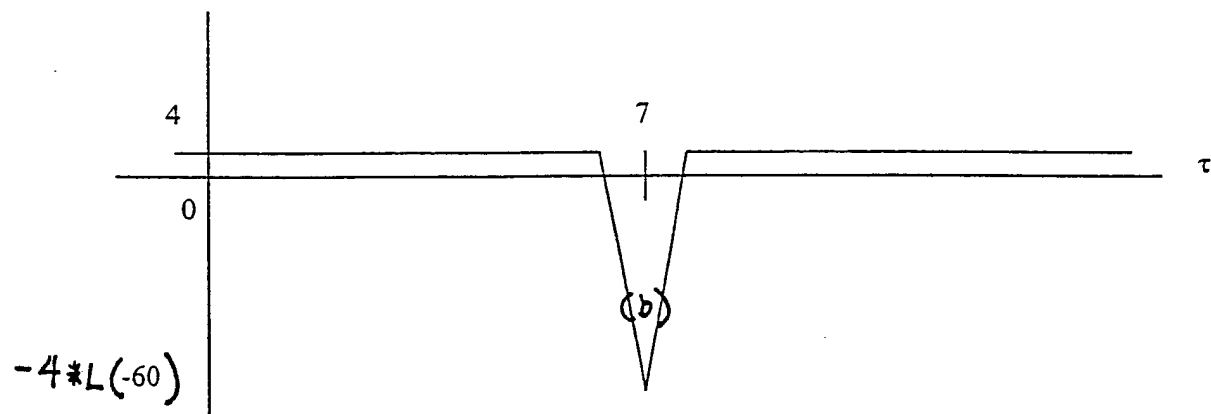


FIG. 22D



	$N_{\text{pilot}}=2$		$N_{\text{pilot}}=3$			$N_{\text{pilot}}=4$			
Bit #	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	0	1	0
3	0	1	0	1	1	1	0	1	1
4	0	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	0	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	0	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	0	0	0	1	0	1	0	1	0
15	0	0	0	1	0	1	0	1	0

FIG. 23A

N_{pilot}	Pilot bit position #	Corresponding word of length 15
2	0	C_1
	1	C_2
3	0	C_1
	2	C_2
4	1	C_1
	3	C_2

FIG. 23B



	$N_{\text{pilot}}=2$		$N_{\text{pilot}}=3$			$N_{\text{pilot}}=4$			
Bit #	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	1	0	0	1	0	1	0	1	0
3	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	1	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	1	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	1	0	0	1	0	1	0	1	0
15	1	0	0	1	0	1	0	1	0

FIG. 23C

N_{pilot}	Pilot bit position #	Corresponding word of length 15
2	1	C_1
3	0	C_1
	2	C_2
4	1	C_1
	3	C_2

FIG. 23D

FIG. 23E

	$N_{\text{pilot}} = 5$					$N_{\text{pilot}} = 6$					
Bit #	0	1	2	3	4	0	1	2	3	4	5
Slot #1	1	1	1	1	0	1	1	1	1	1	0
2	0	0	1	1	0	1	0	0	1	1	0
3	0	1	1	0	1	1	0	1	1	0	1
4	0	0	1	0	0	1	0	0	1	0	0
5	1	0	1	0	1	1	1	0	1	0	1
6	1	1	1	1	0	1	1	1	1	1	0
7	1	1	1	0	0	1	1	1	1	0	0
8	1	0	1	0	0	1	1	0	1	0	0
9	0	1	1	1	0	1	0	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1
11	0	1	1	0	1	1	0	1	1	0	1
12	1	0	1	1	1	1	1	0	1	1	1
13	1	0	1	0	0	1	1	0	1	0	0
14	0	0	1	1	1	1	0	0	1	1	1
15	0	0	1	1	1	1	0	0	1	1	1

	$N_{\text{pilot}} = 7$							$N_{\text{pilot}} = 8$							
Bit #	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
2	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
3	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	0	1	1	0	1	0	1	0	1	0
5	1	1	0	1	0	1	1	1	1	1	0	1	0	1	1
6	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
7	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	1	1	1	0	1	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
12	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
13	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
14	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1
15	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1

FIG. 23F



N_{pilot}	Pilot bit position #	Corresponding word of length 15
5	0	C_1
	1	C_2
	3	C_3
	4	C_4
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
7	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 23G

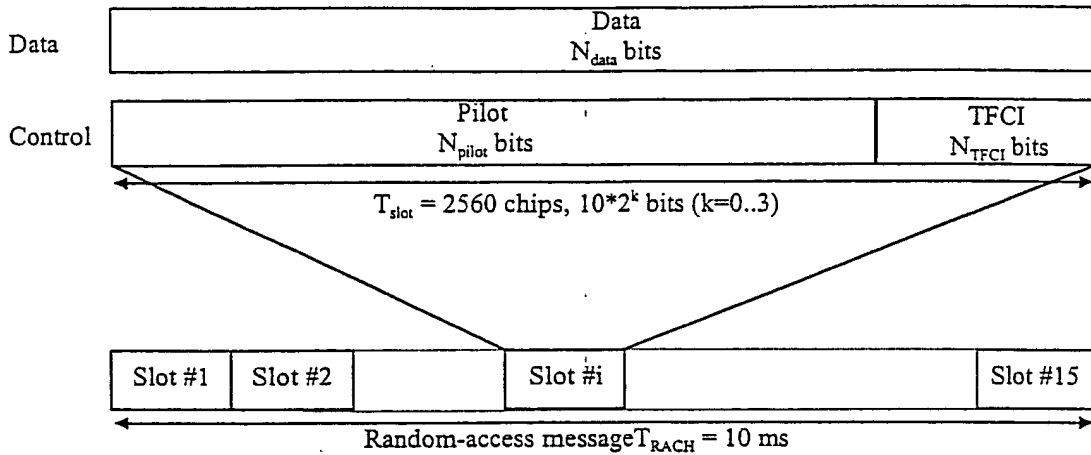


FIG. 23H

Channel Rate (kbps)	Bit	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{pilot}	N_{TFCI}
15	15	256	150	10	8	2	

FIG. 23I

Bit #	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	1	1	0
2	1	0	1	0	1	1	1	0
3	1	0	1	1	1	0	1	1
4	1	0	1	0	1	0	1	0
5	1	1	1	0	1	0	1	1
6	1	1	1	1	1	1	1	0
7	1	1	1	1	1	0	1	0
8	1	1	1	0	1	0	1	0
9	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1
11	1	0	1	1	1	0	1	1
12	1	1	1	0	1	1	1	1
13	1	1	1	0	1	0	1	0
14	1	0	1	0	1	1	1	1
15	1	0	1	0	1	1	1	1

FIG. 23J

	$N_{\text{pilot}}=2$			$N_{\text{pilot}}=4$			$N_{\text{pilot}}=8$				$N_{\text{pilot}}=16$							
Symbol #	0	0	1	0	1	2	3	0	1	2	3	4	5	6	7			
Slot #1	11	11	11	11	11	11	10	11	11	11	10	11	11	11	10			
2	00	11	00	11	00	11	10	11	00	11	10	11	11	11	00			
3	01	11	01	11	01	11	01	11	01	11	01	11	10	11	00			
4	00	11	00	11	00	11	00	11	00	11	00	11	01	11	10			
5	10	11	10	11	10	11	01	11	10	11	01	11	11	11	11			
6	11	11	11	11	11	11	10	11	11	11	10	11	01	11	01			
7	11	11	11	11	11	11	00	11	11	11	00	11	10	11	11			
8	10	11	10	11	10	11	00	11	10	11	00	11	10	11	00			
9	01	11	01	11	01	11	10	11	01	11	10	11	00	11	11			
10	11	11	11	11	11	11	11	11	11	11	11	11	00	11	11			
11	01	11	01	11	01	11	01	11	01	11	01	11	11	11	10			
12	10	11	10	11	10	11	11	11	10	11	11	11	00	11	10			
13	10	11	10	11	10	11	00	11	10	11	00	11	01	11	01			
14	00	11	00	11	00	11	11	11	00	11	11	11	00	11	00			
15	00	11	00	11	00	11	11	11	00	11	11	11	10	11	01			

FIG. 24A

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}}=2$	0	I-CH	C_1
		Q-CH	C_2
$N_{\text{pilot}}=4$	1	I-CH	C_1
		Q-CH	C_2
$N_{\text{pilot}}=8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{\text{pilot}}=16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 24B

	$N_{\text{pilot}} = 4$		$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	00	00	10
2	10	10	11	00	00	01	11	00	00	01	11	10	00	10
3	11	10	11	11	00	00	11	11	00	00	11	10	00	11
4	10	10	11	10	00	01	11	10	00	01	11	00	00	00
5	00	10	11	11	00	11	11	11	00	11	11	01	00	10
6	01	10	11	00	00	10	11	00	00	10	11	11	00	00
7	01	10	11	10	00	10	11	10	00	10	11	01	00	11
8	00	10	11	10	00	11	11	10	00	11	11	10	00	11
9	11	10	11	00	00	00	11	00	00	00	11	01	00	01
10	01	10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	10	11	11	00	00	11	11	00	00	11	00	00	10
12	00	10	11	01	00	11	11	01	00	11	11	00	00	01
13	00	10	11	10	00	11	11	10	00	11	11	11	00	00
14	10	10	11	01	00	01	11	01	00	01	11	10	00	01
15	10	10	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 24C

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 4$	0	I-CH	$-C_1$
		Q-CH	C_2
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_8
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 24D



Symbol #	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	10
2	11	00	11	10	11	00	11	10	11	11	11	00
3	11	01	11	01	11	01	11	01	11	10	11	00
4	11	00	11	00	11	00	11	00	11	01	11	10
5	11	10	11	01	11	10	11	01	11	11	11	11
6	11	11	11	10	11	11	11	10	11	01	11	01
7	11	11	11	00	11	11	11	00	11	10	11	11
8	11	10	11	00	11	10	11	00	11	10	11	00
9	11	01	11	10	11	01	11	10	11	00	11	11
10	11	11	11	11	11	11	11	11	11	00	11	11
11	11	01	11	01	11	01	11	01	11	11	11	10
12	11	10	11	11	11	10	11	11	11	00	11	10
13	11	10	11	00	11	10	11	00	11	01	11	01
14	11	00	11	11	11	00	11	11	11	00	11	00
15	11	00	11	11	11	00	11	11	11	10	11	01

FIG. 25A

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{\text{pilot}} = 16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 25B



	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	00	00	10
2	11	00	00	01	11	00	00	01	11	10	00	10
3	11	11	00	00	11	11	00	00	11	10	00	11
4	11	10	00	01	11	10	00	01	11	00	00	00
5	11	11	00	11	11	11	00	11	11	01	00	10
6	11	00	00	10	11	00	00	10	11	11	00	00
7	11	10	00	10	11	10	00	10	11	01	00	11
8	11	10	00	11	11	10	00	11	11	10	00	11
9	11	00	00	00	11	00	00	00	11	01	00	01
10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	11	00	00	11	11	00	00	11	00	00	10
12	11	01	00	11	11	01	00	11	11	00	00	01
13	11	10	00	11	11	10	00	11	11	11	00	00
14	11	01	00	01	11	01	00	01	11	10	00	01
15	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 25C

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_8
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 25D



Parameters	Uplink
Number of slots per frame	15
Number of bits in the DPCCH (Pilot/TPC/TFCI/FBI)	6/2/2/0
Number of bits in the DPDCH per each slot	10
Spreading factor (DPDCH)	256
Spreading factor (DPCCH)	256
Modulation	HPSK
3dB bandwidth	3.84MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propagation channel	AWGN

FIG. 26A

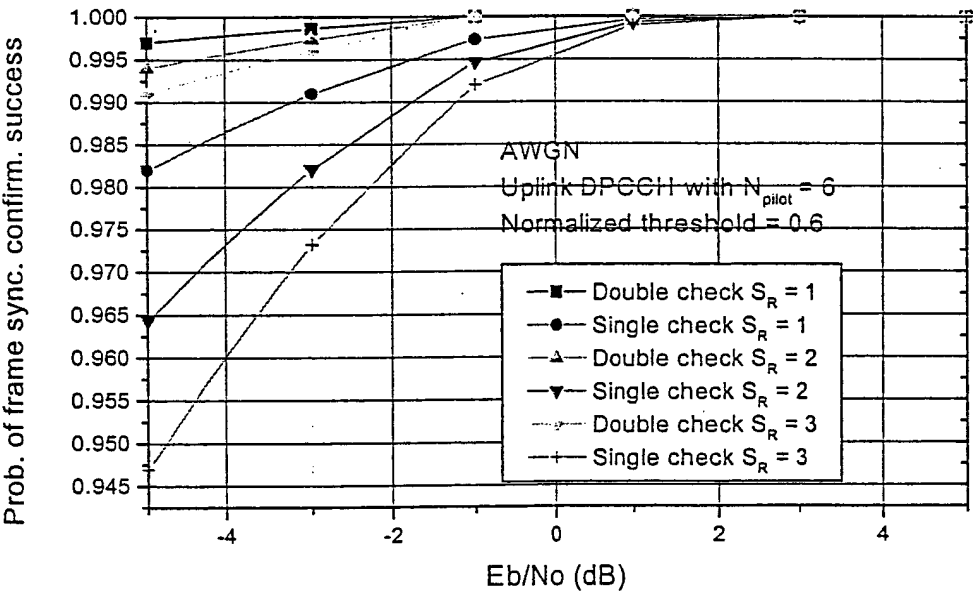


FIG. 26B

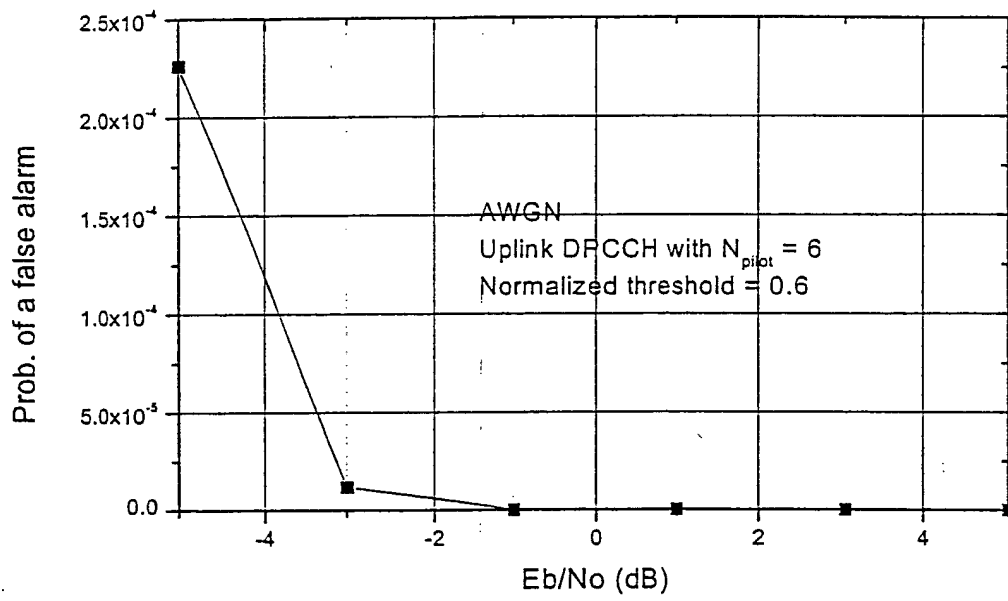


FIG. 26C



FIG. 27

Item	15 slots	16 slots
No. of slots per frame	15	16
No. of N_{pilot} per slot	1) Uplink 2, 3, 4, 5, 6, 7, 8 2) Downlink 2, 4, 8, 16	1) Uplink 5, 6, 7, 8 2) Downlink 4, 8, 16, 32
Slot-Slot possible ?	Yes	Yes
Double-check possible?	Yes (Two correlators such as auto-correlator and cross-correlator are used)	Yes (Auto-correlator)
Single frame synchronization word can be used for frame synchronization ?	Yes since a frame synchronization word has -1 out-of-phase coefficients.	May not be feasible because of +4 or -4 out-of-phase coefficients. The +4 or -4 side lobes can be zero through some particular processing using preferred pair of frame synchronization words.
Frame synchronization words	All 8 frame synchronization words are made out of a single PN code	All 8 frame synchronization words have +4 or -4 out-of-phase coefficient and minus peak value at middle shift.
Autocorrelation function	$R(\tau)=15, \tau=0$ $R(\tau)=-1, \text{elsewhere}$	$R(\tau)=16, \tau=0$ $R(\tau)=-16, \tau=8$ $R(\tau)=0, +4, \text{ or } -4, \text{ elsewhere}$